

IKONAS

SIGGRAPH
79

Graphics Processing Power

- High Speed Architecture for Rapid Image Update and Communication with Host Computer
- 3-D Transformation Hardware
- Real Time Vector Generation Hardware

Image Processing Power

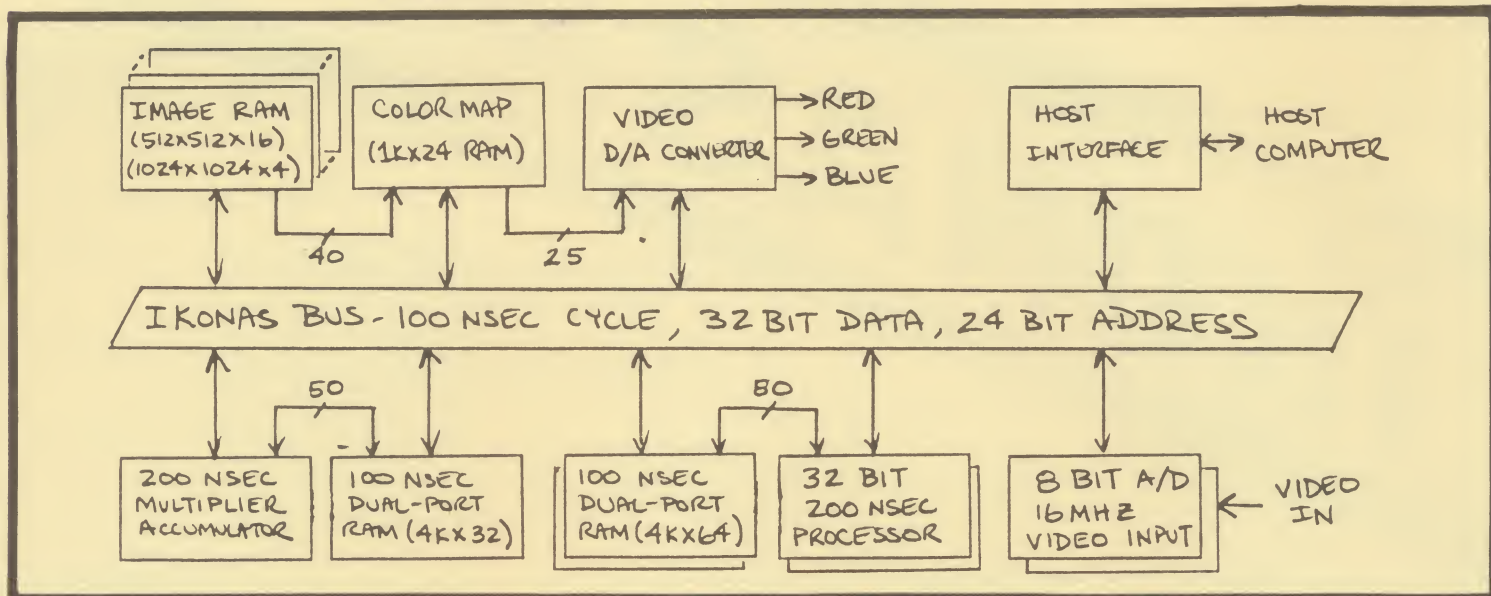
- 32 Bit Processor for Unparalleled Precision
- Firmware Controlled Hardware Multiplier
- Fast, Flexible Look-Up Memory for Gamma Correction and Pseudo-Color

Display Flexibility

- Variable Frame and Line Rates
- Pan, Scroll, and Zoom
- Various Display Formats Possible without Hardware Changes
- Full Window and Viewport Control

Customized Systems

- Modular System Elements
- Easy Expansion and Reconfiguration
- Modules can be Tailored to meet Specific Requirements



Typical System Block Diagram

PROCESSOR

The IKONAS processor is fully user programmable. A fast, 32 bit wide architecture gives unparalleled precision for graphics and image processing applications. The IKONAS processor speeds image computation by executing many repetitive, time consuming calculations from microcode programs. Graphics and image processing performance is further enhanced by allowing the host computer direct access to the image memory as well as to any other memory on the IKONAS bus (color look-up table, microcode store, etc.).

IMAGE MEMORY

IKONAS Image Memory is bit plane organized. Each module can be addressed as 1024x512x1, 512x512x2, or, for multi-pixel access, as 16Kx32. Pan, and scroll in pixel increments are standard as is zoom to any integer ratio 1:1 to 256:1. Modular nature of the units allow memory to be easily expanded from 512x512x2 up to 512x512x32 or 1024x1024x16.

FAST HARDWARE MULTIPLIER

The multiplier accumulator module facilitates the rapid execution of many graphics and image processing tasks which require multiply then add or subtract cycles, e.g. matrix multiplication (3-D point transformation), vector dot and cross product (shade calculations), and weighted averaging (anti-aliasing). Four modules operating in parallel allow sub-microsecond 3-D point transformation.

VIDEO INPUT

Video signals may be written into the image memory in real time. The high speed bus architecture of the IKONAS system allows simultaneous 10 Mbyte/sec video input, 10 Mbyte/sec video output, and 2 Mbyte/sec host data transfer.

ANIMATION

Computer graphics animation is a fast developing field with applications in physical system modeling, display of time varying data, and cartooning. IKONAS systems support computer animation using color-map or run-length encoding techniques with a variety of color look-up tables and run-length decoders. Image Memory serves as a run-length animation buffer for encoded images as well as frame buffer for unencoded images. The Mass Image Storage module can hold up to 60 seconds of moderately complex animation for real-time playback or can be used to store unencoded images.

FLEXIBILITY, EXPANDABILITY

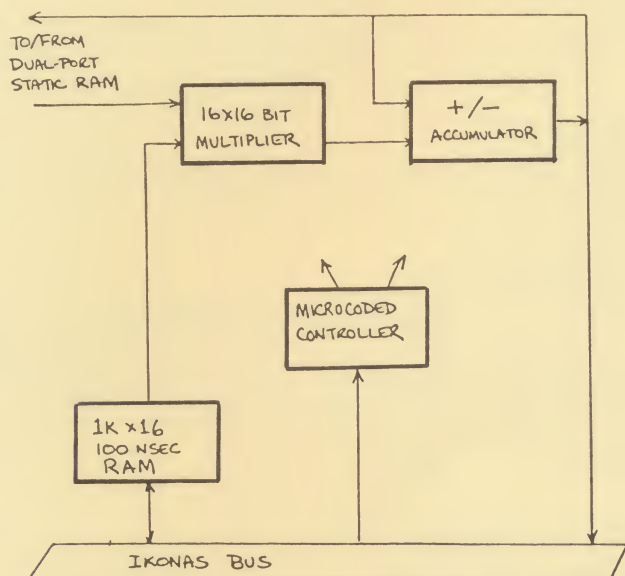
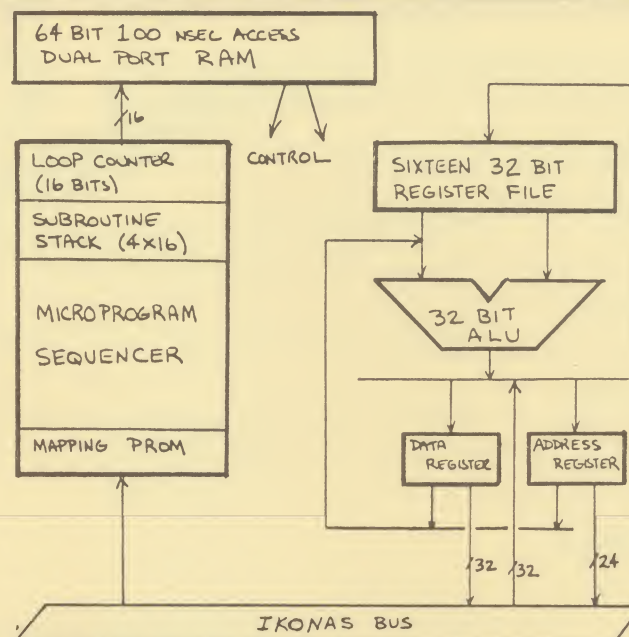
IKONAS systems are entirely modular, being configured from various modules attached to a common communication bus. Systems are easily expanded. One cage holds 20 cards; multiple cage configurations are possible. A user can begin with a simple frame buffer and add processor, image input, and hardware multiplier modules later.

CUSTOMIZED SYSTEMS

Modular design of components means that systems are configured to meet a customer's particular needs. Extensive use of microprogrammed controllers in the modules means that custom modifications are easily performed in many cases. A wide variety of options is available. IKONAS is particularly interested in providing state-of-the-art hardware for research and special purpose graphics and image processing systems.

PROCESSOR

- 32 bit bipolar microprogrammable processor; 200 nsec cycle; 16 internal registers.
- 64 bit wide microcode words stored in standard 100 nsec static memory.
- Architecture allows simultaneous execution of ALU functions and program control; execution speeds enhanced by hardware loop counter and subroutine stack.
- Microcode store easily expanded to 32K of 64 bit words.
- IKASM™, microcode cross assembler, written in standard FORTRAN.



MULTIPLIER/ACCUMULATOR

- 200 nsec 16x16 bit multiply and 35 bit add/subtract accumulate.
- 1024x16 on card buffer memory useful for storing elements of transformation arrays or filter coefficients.
- Operation controlled by on card firmware.
- Data paths available for recursive filtering.
- Direct port to standard 100 nsec 32 bit static memories.

VIDEO INPUT

- RS-170 compatible.
- 8 bits/sample; 16 MHz maximum sample rate.
- Full window and viewpoint control (independent of output window and viewport).

RUN-LENGTH DECODERS/ANIMATION

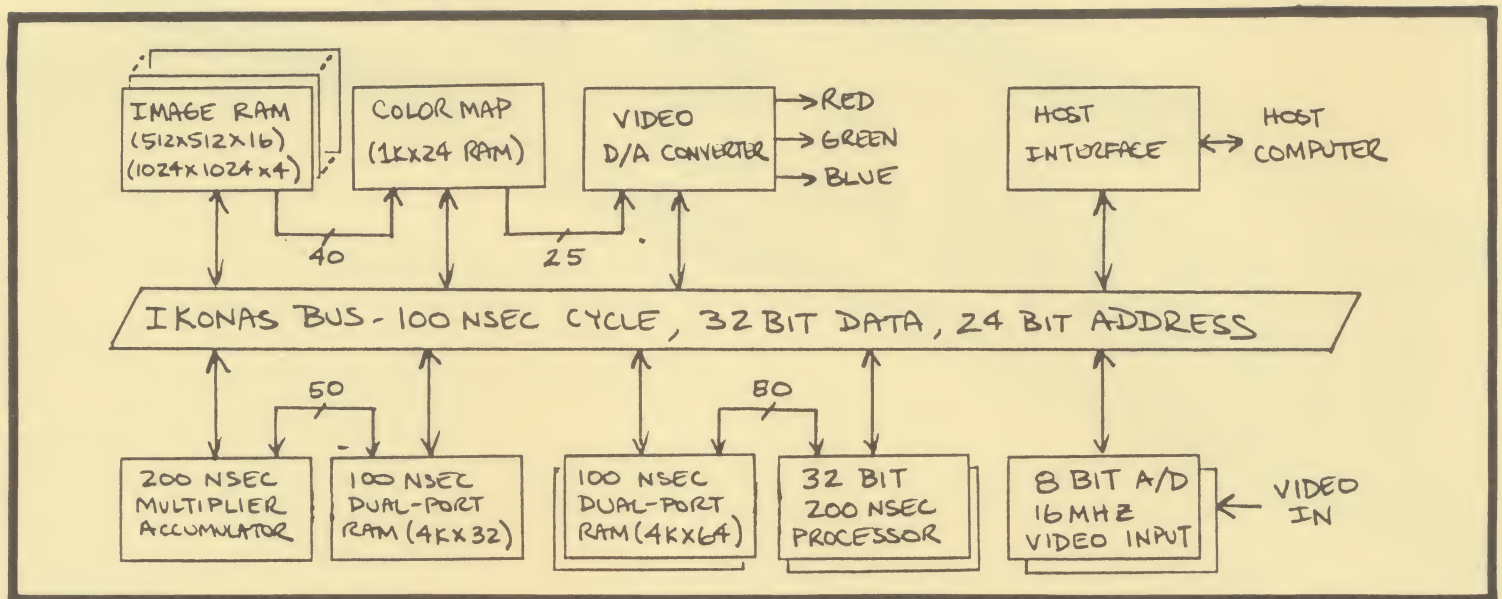
- Shade Look-Up Decoder uses 1024x24 color look-up table. 10 bit color code selects one of over 1000 colors without changing map entries.
- Color/Intensity Decoder uses 8 bits of encoded color to address color map. Displayed shade is determined by multiplying 8 bit red, green, and blue output of map by encoded intensity value.
- Direct Shade Decoder for codes which contain 8 bits each of red, green, and blue, as well as run-length. Requires no look-up table.

VIDEO OUTPUT

- Flexible system configuration and video output control. Memory can be displayed as 512x512x16 or 1024x1024x4 without hardware changes.
- Full window and viewpoint control; software controllable frame rate, line rate, and resolution.
- Flexible color map addressing and filling.
- Bit plane organization allow easy implementation of overlays and easy memory expansion.

LOOK-UP TABLES

- Standard 1024x24 Look-Up table allows full 8 bits resolution of red, green, and blue.
- Special look-up configurations (including hardware intensity multiplication) available.



Typical System Block Diagram

PROCESSOR

The IKONAS processor is fully user programmable. A fast, 32 bit wide architecture gives unparalleled precision for graphics and image processing applications. The IKONAS processor speeds image computation by executing many repetitive, time consuming calculations from microcode programs. Graphics and image processing performance is further enhanced by allowing the host computer direct access to the image memory as well as to any other memory on the IKONAS bus (color look-up table, microcode store, etc.).

IMAGE MEMORY

IKONAS Image Memory is bit plane organized. Each module can be addressed as 1024x512x1, 512x512x2, or, for multi-pixel access, as 16Kx32. Pan, and scroll in pixel increments are standard as is zoom to any integer ratio 1:1 to 256:1. Modular nature of the units allow memory to be easily expanded from 512x512x2 up to 512x512x32 or 1024x1024x16.

FAST HARDWARE MULTIPLIER

The multiplier accumulator module facilitates the rapid execution of many graphics and image processing tasks which require multiply then add or subtract cycles, e.g. matrix multiplication (3-D point transformation), vector dot and cross product (shade calculations), and weighted averaging (anti-aliasing). Four modules operating in parallel allow sub-microsecond 3-D point transformation.

VIDEO INPUT

Video signals may be written into the image memory in real time. The high speed bus architecture of the IKONAS system allows simultaneous 10 Mbyte/sec video input, 10 Mbyte/sec video output, and 2 Mbyte/sec host data transfer.

ANIMATION

Computer graphics animation is a fast developing field with applications in physical system modeling, display of time varying data, and cartooning. IKONAS systems support computer animation using color-map or run-length encoding techniques with a variety of color look-up tables and run-length decoders. Image Memory serves as a run-length animation buffer for encoded images as well as frame buffer for unencoded images. The Mass Image Storage module can hold up to 60 seconds of moderately complex animation for real-time playback or can be used to store unencoded images.

FLEXIBILITY, EXPANDABILITY

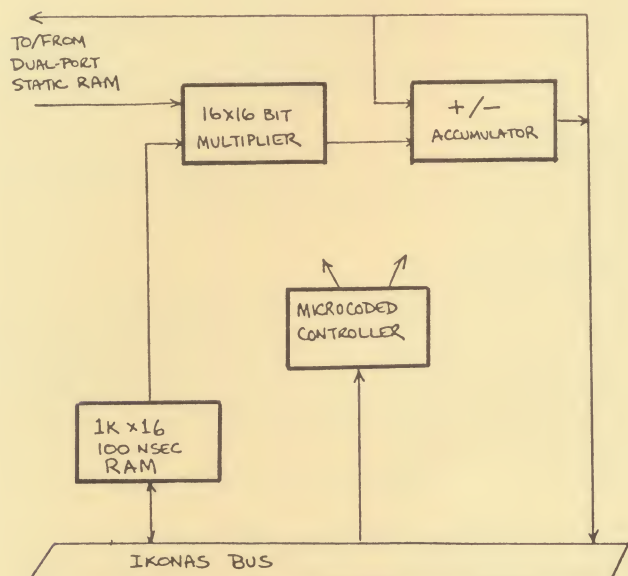
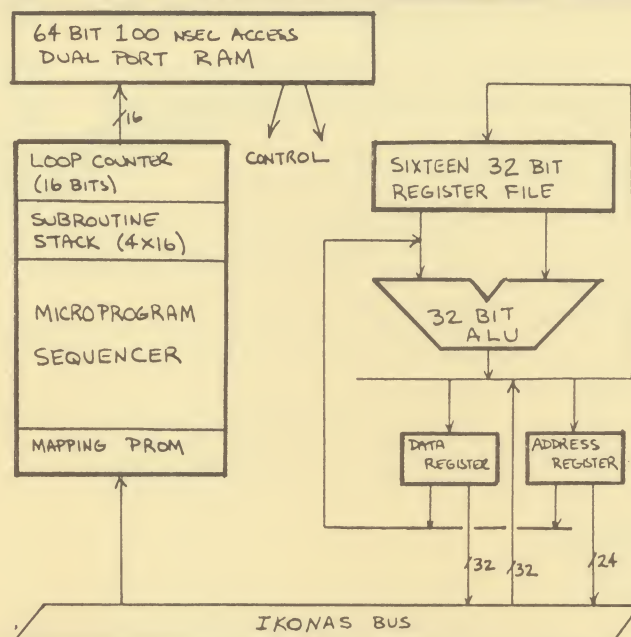
IKONAS systems are entirely modular, being configured from various modules attached to a common communication bus. Systems are easily expanded. One cage holds 20 cards; multiple cage configurations are possible. A user can begin with a simple frame buffer and add processor, image input, and hardware multiplier modules later.

CUSTOMIZED SYSTEMS

Modular design of components means that systems are configured to meet a customer's particular needs. Extensive use of microprogrammed controllers in the modules means that custom modifications are easily performed in many cases. A wide variety of options is available. IKONAS is particularly interested in providing state-of-the-art hardware for research and special purpose graphics and image processing systems.

PROCESSOR

- 32 bit bipolar microprogrammable processor; 200 nsec cycle; 16 internal registers.
- 64 bit wide microcode words stored in standard 100 nsec static memory.
- Architecture allows simultaneous execution of ALU functions and program control; execution speeds enhanced by hardware loop counter and subroutine stack.
- Microcode store easily expanded to 32K of 64 bit words.
- IKASM™, microcode cross assembler, written in standard FORTRAN.



MULTIPLIER/ACCUMULATOR

- 200 nsec 16x16 bit multiply and 35 bit add/subtract accumulate.
- 1024x16 on card buffer memory useful for storing elements of transformation arrays or filter coefficients.
- Operation controlled by on card firmware.
- Data paths available for recursive filtering.
- Direct port to standard 100 nsec 32 bit static memories.

VIDEO INPUT

- RS-170 compatible.
- 8 bits/sample; 16 MHz maximum sample rate.
- Full window and viewpoint control (independent of output window and viewpoint).

RUN-LENGTH DECODERS/ANIMATION

- Shade Look-Up Decoder uses 1024x24 color look-up table. 10 bit color code selects one of over 1000 colors without changing map entries.
- Color/Intensity Decoder uses 8 bits of encoded color to address color map. Displayed shade is determined by multiplying 8 bit red, green, and blue output of map by encoded intensity value.
- Direct Shade Decoder for codes which contain 8 bits each of red, green, and blue, as well as run-length. Requires no look-up table.

VIDEO OUTPUT

- Flexible system configuration and video output control. Memory can be displayed as 512x512x16 or 1024x1024x4 without hardware changes.
- Full window and viewpoint control; software controllable frame rate, line rate, and resolution.
- Flexible color map addressing and filling.
- Bit plane organization allow easy implementation of overlays and easy memory expansion.

LOOK-UP TABLES

- Standard 1024x24 Look-Up table allows full 8 bits resolution of red, green, and blue.
- Special look-up configurations (including hardware intensity multiplication) available.

STANDARD MODULES

PROCESSOR ELEMENTS

BMP 32	Bipolar Microprocessor 32 bit microprogrammable 200 nsec bipolar microprocessor with 16 internal registers, full carry look-ahead, and optional hardware multiply.
MPS 16	Microprogram Sequencer Capable of addressing up to 64K words of 64 bit wide microprogram memory.
MA 1024	Multiplier-Accumulator 16x16 bit 200 nsec multiplier with 35 bit add/subtract accumulator. 1024x16 bit memory on card. Microprogram controlled by on card firmware for graphics transformations and filtering.

MEMORY

DR 16B	Dynamic RAM Multi-format memory accessed as 512x512x2, 1024x512x1, or 16Kx32. Used for frame buffer, run-length memory, or general purpose memory. 300 nsec access.
ROM 16 ROM 32 ROM 64	Read Only Memory 16K, 32K, or 64Kx16 bit memory for function look-up and/or firmware storage. Sine and cosine functions standard. 100 nsec access.
SR1 SR 4 SR 8	Static RAM 1K, 4K, or 8Kx32 bit high speed, dual port memory used for display list or microcode memory. 100 nsec access.

MASS IMAGE STORAGE

KD 64	Disk and Controller 64 Mbytes of storage for encoded real-time animation or encoded image storage. 1 Mbyte/sec transfer rate.
-------	--

VIDEO INPUT

VI 8	Video Input Module (2 Cards) Real-time storage of video signals. 16 MHz sample rate; 8 bits resolution/sample. Full windowing and viewport control.
------	--

VIDEO OUTPUT

FB/HC	Frame Buffer Controller Controls video refresh and generates all system timing. Microprogram controlled to allow flexible display formats up to 1024x1024x16 (or 512x512x32). Full window and viewport control.
RLI 8	Run-Length Decoder (Intensity Control) Used for color shade-intensity run-length coded animation (with LU 24).
RLS 10	Run-Length Decoder (Shade Look-Up) Used for shade look-up run length-coded animation (with LU 24).
RLU 24	Run-length Decoder (Unencoded Shade) Used for 24 bit/pixel run-length coded animation.
LU 24	Color Look-Up Table 1024x24 bit memory used for color look-up (color map) operation in frame buffer system or in run-length coded animation. 10MHz throughput.
LU 24/HS	Color Look-Up Table/High Speed 40 MHz version of the LU 24.
LUI 24	Color Look-Up Table (Intensity Control) LU 24 with separate 8 bit intensity multiplication of red, green, and blue.
VO 30	Gamma Correction and Video Output Module Three 8 bit video outputs with gamma correction. RS-170. 10 MHz throughput.
VO 24/HS	Video Output Module/High Speed Three 8 bit video outputs with 40 MHz throughput. RS-170 or RS-343A.

INTERFACES

Fast DMA or memory mapped interfaces for popular minicomputers are available.

MISCELLANEOUS

CB 20	Card Cage and Power Supply Holds up to 20 cards. 5 volts @ 200 amps; +12 volts; @ 30 amps; -5 volts @ 12 amps; + 15 volts @ 3 amps power supplies and fan cooling are included. Multiple cage configurations are possible. 19"x22.75"x28" slide mounted.
RK 6	Rack 70 inches of rack mounting space.

IKONAS GRAPHICS SYSTEMS, INC. is a supplier of high performance hardware for raster computer graphics and image display. IKONAS systems incorporate state-of-the-art concepts in computer architecture and implementation. Extensive use of microprogrammed controllers allows maximum flexibility and the exploitation of concurrently operating processes. The systems are conservatively designed using high performance but thoroughly proven components.

The extremely flexible architecture of IKONAS graphics systems means that not only is future expandability assured, but also that each system is individually configured to meet a customer's needs. In order to provide the most appropriate equipment for a particular customer IKONAS can supply standard products, modifications to standard products, or complete custom design. Our philosophy is to provide our customers with the hardware they want and need rather than forcing them to compromise. IKONAS strives to meet the graphics requirements of advanced, high-technology research groups.

IKONAS personnel have the background in computer graphics and image processing hardware and software to understand your problems and to provide equipment to solve those problems with state-of-the-art hardware and firmware at a reasonable cost.

IKONAS GRAPHICS SYSTEMS INC

403 GLENWOOD AVE — RALEIGH NC 27603 — 919/833-5401

AED color graphics terminal

SIGGRAPH 79.



AED 512 Color Graphics Terminal

- Up to 256 simultaneous colors or levels of gray.
- 2^{24} different hue/saturation/intensity combinations.
- Built-in 14" or 19" high-resolution color CRT.
- 2-, 3-, ...to 16-to-1 zooming. Panning via integral joystick.
- Vector and circle generation. Curve fill. Single-point addressability. Video memory readback. Runs encoded image transfers.
- Crosshair cursor with programmable color and blink.
- Vertical and horizontal scroll.
- Display resolution: 512 points horizontal, 480 points vertical.
- Industry standard serial interface, plus high-speed parallel direct video memory access.
- Will drive external monitors and RGB video tape equipment. External sync input.
- Programmable character fonts and 8 programmable special function keys.
- Full alphanumeric capability.
- Gray scale hard-copy unit available.
- Priced from \$6,875. (1 memory plane, \$885 each Devco.)

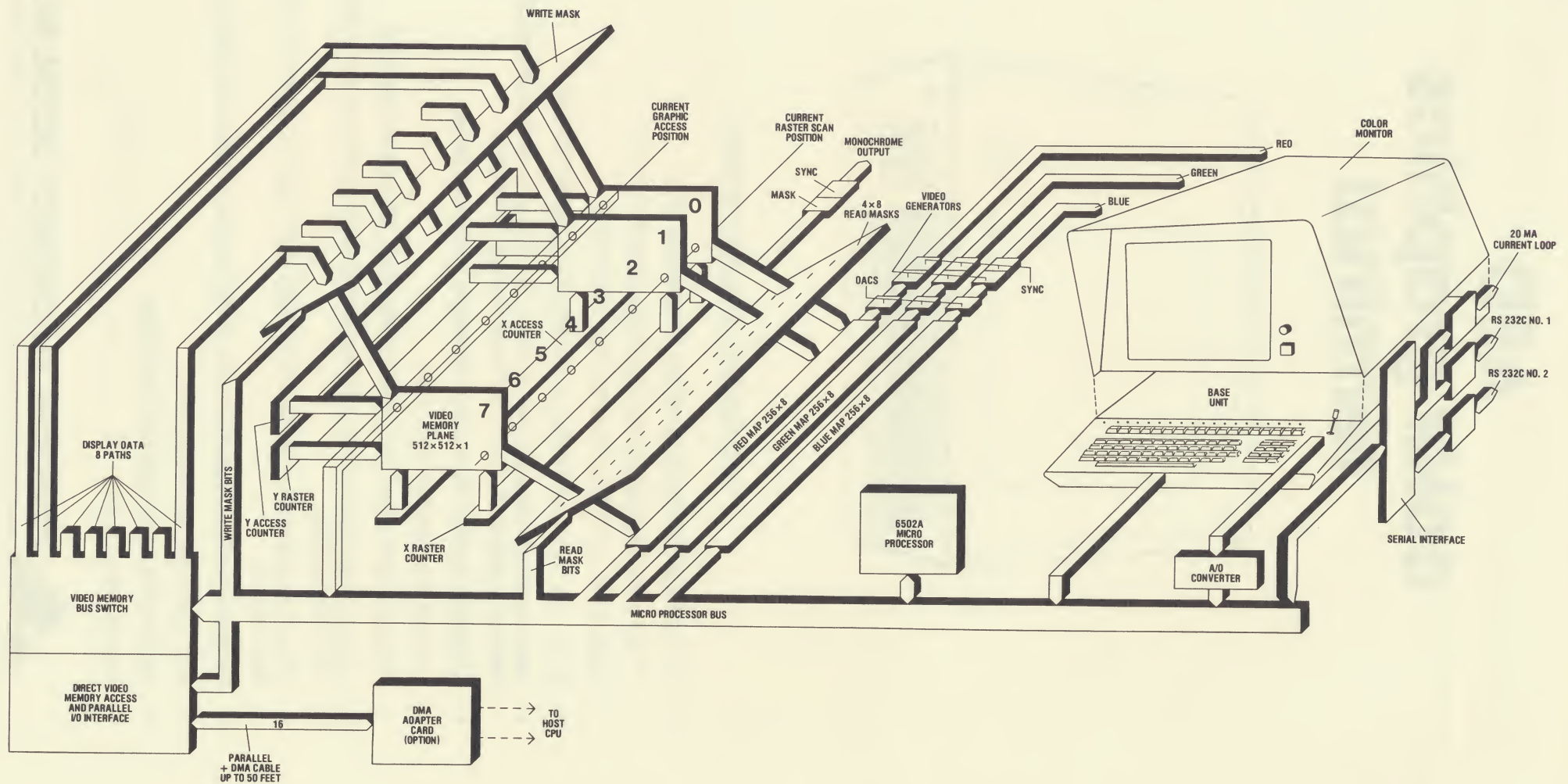
Uses
Nova
boards.



ADVANCED ELECTRONICS DESIGN, INC.

Headquarters: 440 Potrero Ave., Sunnyvale, California 94086 / Telephone: 408-733-3555

Advanced frame buffer architecture of the AED 512



IKONAS

SIGGRAPH 79



4096 frame buffer

512 X 512 X 8



24-bit color exp.

Ru-1688 encoding

Bipolar bit-slice

AS 35 K

Graphics Processing Power

- High Speed Architecture for Rapid Image Update and Communication with Host Computer
- 3-D Transformation Hardware
- Real Time Vector Generation Hardware

Image Processing Power

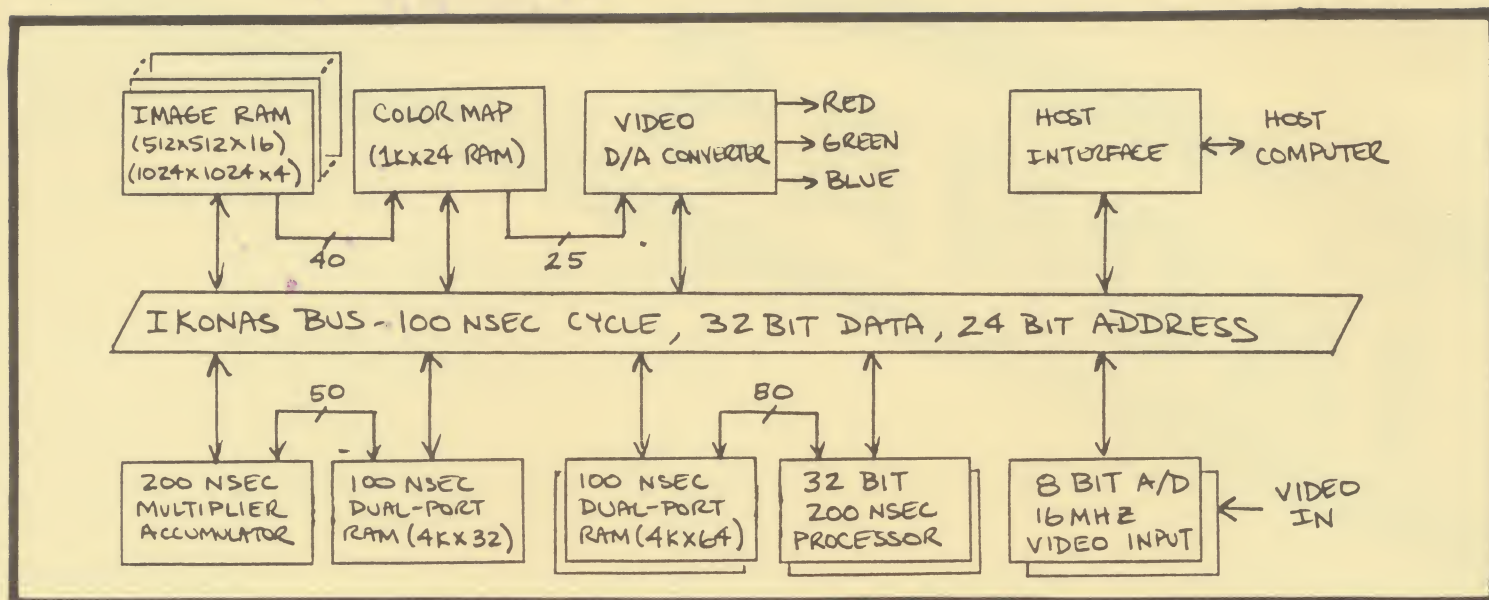
- 32 Bit Processor for Unparalleled Precision
- Firmware Controlled Hardware Multiplier
- Fast, Flexible Look-Up Memory for Gamma Correction and Pseudo-Color

Display Flexibility

- Variable Frame and Line Rates
- Pan, Scroll, and Zoom
- Various Display Formats Possible without Hardware Changes
- Full Window and Viewport Control

Customized Systems

- Modular System Elements
- Easy Expansion and Reconfiguration
- Modules can be Tailored to meet Specific Requirements



Typical System Block Diagram

PROCESSOR

The IKONAS processor is fully user programmable. A fast, 32 bit wide architecture gives unparalleled precision for graphics and image processing applications. The IKONAS processor speeds image computation by executing many repetitive, time consuming calculations from microcode programs. Graphics and image processing performance is further enhanced by allowing the host computer direct access to the image memory as well as to any other memory on the IKONAS bus (color look-up table, microcode store, etc.).

IMAGE MEMORY

IKONAS Image Memory is bit plane organized. Each module can be addressed as 1024x512x1, 512x512x2, or, for multi-pixel access, as 16Kx32. Pan, and scroll in pixel increments are standard as is zoom to any integer ratio 1:1 to 256:1. Modular nature of the units allow memory to be easily expanded from 512x512x2 up to 512x512x32 or 1024x1024x16.

FAST HARDWARE MULTIPLIER

The multiplier accumulator module facilitates the rapid execution of many graphics and image processing tasks which require multiply then add or subtract cycles, e.g. matrix multiplication (3-D point transformation), vector dot and cross product (shade calculations), and weighted averaging (anti-aliasing). Four modules operating in parallel allow sub-microsecond 3-D point transformation.

VIDEO INPUT

Video signals may be written into the image memory in real time. The high speed bus architecture of the IKONAS system allows simultaneous 10 Mbyte/sec video input, 10 Mbyte/sec video output, and 2 Mbyte/sec host data transfer.

ANIMATION

Computer graphics animation is a fast developing field with applications in physical system modeling, display of time varying data, and cartooning. IKONAS systems support computer animation using color-map or run-length encoding techniques with a variety of color look-up tables and run-length decoders. Image Memory serves as a run-length animation buffer for encoded images as well as frame buffer for unencoded images. The Mass Image Storage module can hold up to 60 seconds of moderately complex animation for real-time playback or can be used to store unencoded images.

FLEXIBILITY, EXPANDABILITY

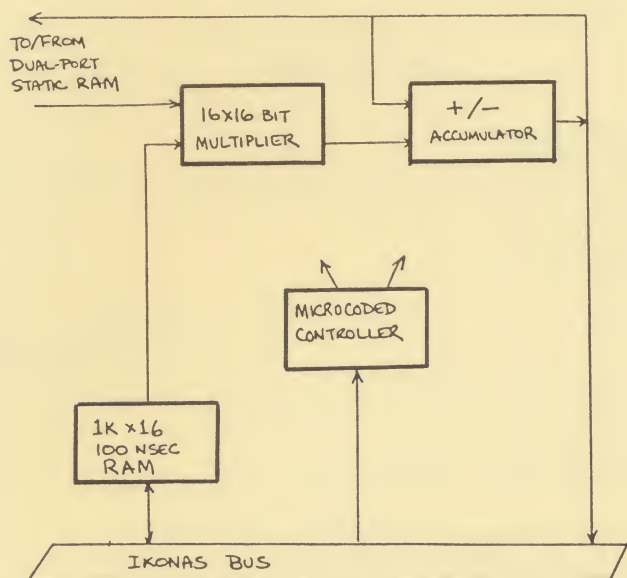
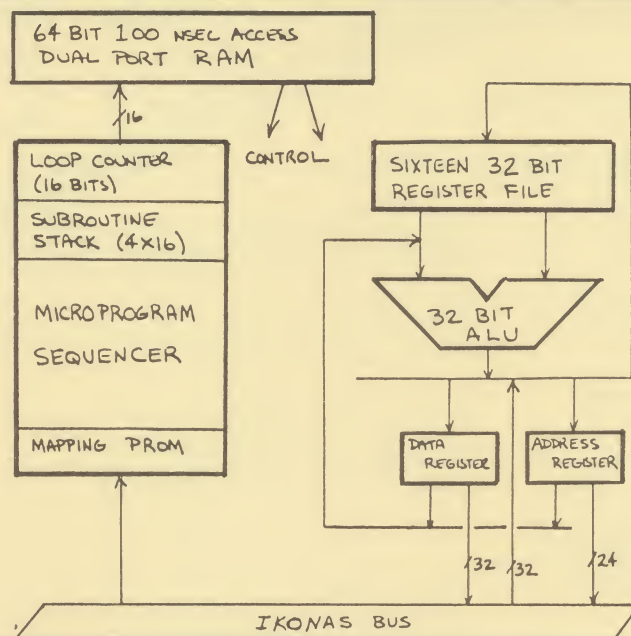
IKONAS systems are entirely modular, being configured from various modules attached to a common communication bus. Systems are easily expanded. One cage holds 20 cards; multiple cage configurations are possible. A user can begin with a simple frame buffer and add processor, image input, and hardware multiplier modules later.

CUSTOMIZED SYSTEMS

Modular design of components means that systems are configured to meet a customer's particular needs. Extensive use of microprogrammed controllers in the modules means that custom modifications are easily performed in many cases. A wide variety of options is available. IKONAS is particularly interested in providing state-of-the-art hardware for research and special purpose graphics and image processing systems.

PROCESSOR

- 32 bit bipolar microprogrammable processor; 200 nsec cycle; 16 internal registers.
- 64 bit wide microcode words stored in standard 100 nsec static memory.
- Architecture allows simultaneous execution of ALU functions and program control; execution speeds enhanced by hardware loop counter and subroutine stack.
- Microcode store easily expanded to 32K of 64 bit words.
- IKASM™, microcode cross assembler, written in standard FORTRAN.



MULTIPLIER/ACCUMULATOR

- 200 nsec 16x16 bit multiply and 35 bit add/subtract accumulate.
- 1024x16 on card buffer memory useful for storing elements of transformation arrays or filter coefficients.
- Operation controlled by on card firmware.
- Data paths available for recursive filtering.
- Direct port to standard 100 nsec 32 bit static memories.

VIDEO INPUT

- RS-170 compatible.
- 8 bits/sample; 16 MHz maximum sample rate.
- Full window and viewpoint control (independent of output window and viewport).

RUN-LENGTH DECODERS/ANIMATION

- Shade Look-Up Decoder uses 1024x24 color look-up table. 10 bit color code selects one of over 1000 colors without changing map entries.
- Color/Intensity Decoder uses 8 bits of encoded color to address color map. Displayed shade is determined by multiplying 8 bit red, green, and blue output of map by encoded intensity value.
- Direct Shade Decoder for codes which contain 8 bits each of red, green, and blue, as well as run-length. Requires no look-up table.

VIDEO OUTPUT

- Flexible system configuration and video output control. Memory can be displayed as 512x512x16 or 1024x1024x4 without hardware changes.
- Full window and viewpoint control; software controllable frame rate, line rate, and resolution.
- Flexible color map addressing and filling.
- Bit plane organization allow easy implementation of overlays and easy memory expansion.

LOOK-UP TABLES

- Standard 1024x24 Look-Up table allows full 8 bits resolution of red, green, and blue.
- Special look-up configurations (including hardware intensity multiplication) available.

STANDARD MODULES

PROCESSOR ELEMENTS

BMP 32	Bipolar Microprocessor 32 bit microprogrammable 200 nsec bipolar microprocessor with 16 internal registers, full carry look-ahead, and optional hardware multiply.
MPS 16	Microprogram Sequencer Capable of addressing up to 64K words of 64 bit wide microprogram memory.
MA 1024	Multiplier-Accumulator 16x16 bit 200 nsec multiplier with 35 bit add/subtract accumulator. 1024x16 bit memory on card. Microprogram controlled by on card firmware for graphics transformations and filtering.

MEMORY

DR 16B	Dynamic RAM Multi-format memory accessed as 512x512x2, 1024x512x1, or 16Kx32. Used for frame buffer, run-length memory, or general purpose memory. 300 nsec access.
ROM 16 ROM 32 ROM 64	Read Only Memory 16K, 32K, or 64Kx16 bit memory for function look-up and/or firmware storage. Sine and cosine functions standard. 100 nsec access.
SR1 SR 4 SR 8	Static RAM 1K, 4K, or 8Kx32 bit high speed, dual port memory used for display list or microcode memory. 100 nsec access.

MASS IMAGE STORAGE

KD 64	Disk and Controller 64 Mbytes of storage for encoded real-time animation or encoded image storage. 1 Mbyte/sec transfer rate.
-------	--

VIDEO INPUT

VI 8	Video Input Module (2 Cards) Real-time storage of video signals. 16 MHz sample rate; 8 bits resolution/sample. Full windowing and viewport control.
------	--

VIDEO OUTPUT

FB/HC	Frame Buffer Controller Controls video refresh and generates all system timing. Microprogram controlled to allow flexible display formats up to 1024x1024x16 (or 512x512x32). Full window and viewport control.
RLI 8	Run-Length Decoder (Intensity Control) Used for color shade-intensity run-length coded animation (with LU 24).
RLS 10	Run-Length Decoder (Shade Look-Up) Used for shade look-up run length-coded animation (with LU 24).
RLU 24	Run-length Decoder (Unencoded Shade) Used for 24 bit/pixel run-length coded animation.
LU 24	Color Look-Up Table 1024x24 bit memory used for color look-up (color map) operation in frame buffer system or in run-length coded animation. 10MHz throughput.
LU 24/HS	Color Look-Up Table/High Speed 40 MHz version of the LU 24.
LUI 24	Color Look-Up Table (Intensity Control) LU 24 with separate 8 bit intensity multiplication of red, green, and blue.
VO 30	Gamma Correction and Video Output Module Three 8 bit video outputs with gamma correction. RS-170. 10 MHz throughput.
VO 24/HS	Video Output Module/High Speed Three 8 bit video outputs with 40 MHz throughput. RS-170 or RS-343A.

INTERFACES

Fast DMA or memory mapped interfaces for popular minicomputers are available.

MISCELLANEOUS

CB 20	Card Cage and Power Supply Holds up to 20 cards. 5 volts @ 200 amps; +12 volts; @ 30 amps; -5 volts @ 12 amps; + 15 volts @ 3 amps power supplies and fan cooling are included. Multiple cage configurations are possible. 19"x22.75"x28" slide mounted.
RK 6	Rack 70 inches of rack mounting space.

IKONAS GRAPHICS SYSTEMS, INC. is a supplier of high performance hardware for raster computer graphics and image display. IKONAS systems incorporate state-of-the-art concepts in computer architecture and implementation. Extensive use of microprogrammed controllers allows maximum flexibility and the exploitation of concurrently operating processes. The systems are conservatively designed using high performance but thoroughly proven components.

The extremely flexible architecture of IKONAS graphics systems means that not only is future expandability assured, but also that each system is individually configured to meet a customer's needs. In order to provide the most appropriate equipment for a particular customer IKONAS can supply standard products, modifications to standard products, or complete custom design. Our philosophy is to provide our customers with the hardware they want and need rather than forcing them to compromise. IKONAS strives to meet the graphics requirements of advanced, high-technology research groups.

IKONAS personnel have the background in computer graphics and image processing hardware and software to understand your problems and to provide equipment to solve those problems with state-of-the-art hardware and firmware at a reasonable cost.

IKONAS GRAPHICS SYSTEMS INC

403 GLENWOOD AVE — RALEIGH NC 27603 — 919/833-5401